A Level Computer Science

Exam Style Questions

Unit 1.4.2

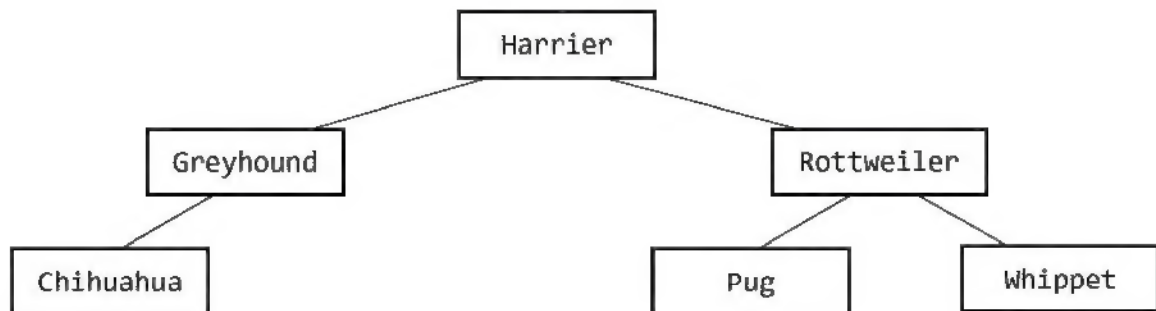*Data Structures*

Binary Trees

Name		Date	

Score	Percentage	Grade
/ 29		

Question 1

A binary search tree is used to store the names of dog breeds.

a) The breeds Doberman and Dalmatian are added to the tree in that order.
    Add them to the tree above.

[2]

b) Explain how you would determine if the breed Pug is in the binary search tree.

[3]

c) Explain how you would determine if the breed Spaniel is in the binary search tree.

[3]

d) The tree is coded using object-oriented programming.

Each dog breed is represented by an object of class Node.
The Node class has the methods:

getLeftNode() – returns the left-hand child node or null if there is no left-hand child.
getRightNode() – returns the right-hand child node or null if there is no right-hand child.
getBreed() – returns the name of the breed stored in that node.

The program allows for a breed name to be entered, and depending on whether the breed is in the tree or not, displays either:

<breed name> is not in the tree.

or

<breed name> is in the tree.

Complete the program below. Credit will be given for readability of code

```
name = input ("Enter the name of a breed")
breedNode = tree.root()     // breedNode is an object of type Node
                            // representing the root of the tree
```

[6]

Question 2

A binary search tree, colour, stores data about colours that are entered into a computer.
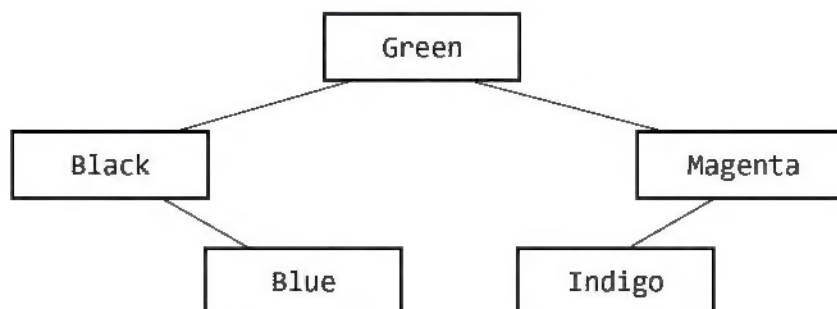A binary search tree is one example of a type of tree.

a) State the main features of a tree.

[3]

b) State the features that make a tree a binary search tree.

[1]

The current contents of colour are shown

```
                        ┌─────────┐
                        │  Green  │
                        └─────────┘
              ┌─────────┐         ┌─────────┐
              │  Black  │         │ Magenta │
              └─────────┘         └─────────┘
                    ┌───────┐   ┌────────┐
                    │  Blue │   │ Indigo │
                    └───────┘   └────────┘
```

c) Add the following colours to the tree above in the order written:

    Brown   White   Orange   Purple

[4]

Question 3

The binary search tree, values, is stored as an array of nodes. Each node has a left pointer, a right pointer and the data being stored. The following data is entered in the order shown below:

| 68 | 30 | 73 | 22 | 1 | 90 | 70 |

The following table shows the data stored in the array. The Root Pointer stores the node number of the first element in the tree.

Array Index	Left Pointer	Data	Right Pointer
0	1	68	2
1		30	
2		73	
3		22	
4		1	
5		90	
6		70	

Root Pointer

0

Free Pointer

7

a) Complete the remaining Left Pointer and Right Pointer values for the data entered in the table above. Where the pointer is null, leave the space empty.

[3]

b) State the purpose of the Free Pointer.

[1]

c) The following data is added to the array in the given order:

| 6 | 100 |

Add the new nodes to the table above and update any relevant pointers.

[4]